TITLE

Method of detecting an end point of a CMP process

ABSTRACT OF THE DISCLOSURE

The invention provides a method of determining an end point of a chemical mechanical polishing (CMP) process by using infrared spectroscopy, for removing a first thin film on a semiconductor chip while preventing an underlying second thin film from being overpolished. When the infrared spectrum is passed through the two thin films on the semiconductor chip, each thin film absorbs an infrared light with a different wave number, resulting in a different absorption peak, which is used to plot an infrared absorption curve. From the beginning of a CMP process, the infrared absorption rate keeps changing as the process continues, and the position of the absorption peak of each thin film can be detected. The end point of the CMP process can be determined as when the infrared absorption rate of the first thin film is apparently not changing and that of the second thin film starts to decrease.

CLAIMS

What is claimed is:

1. A method for determining the end of a chemical mechanical polishing (CMP) process which is used to remove a first thin film of a semiconductor chip, the first thin film having a second thin film underneath on a first side of the semiconductor chip, and the first thin film and the second thin film absorbing IR light of different wavelengths, the method comprising the steps of:

adjusting to guide an IR light source to the first side of the semiconductor chip;

using an IR detector installed on a second side of the semiconductor chip to detect the emitted IR light;

plotting the IR absorption rates of the first thin film and the second thin film;

starting a CMP process and using the IR absorption rates of the first thin film and the second thin film to make an IR absorption curve; and

determining a polishing end-point of the CMP process when the IR absorption rate of the first thin film is apparently not changing and the IR absorption rate of the second thin film starts to decrease.

2. The method of claim 1, wherein the first and second thin films are non-metal layers.

3. The method of claim 2, wherein the first and second thin films are selected from a silicon oxide layer and a silicon nitride layer.

4. The method of claim 1, wherein the IR absorption rates of the first and second thin films fall in an infrared spectrum.

5. The method of claim 1, wherein the IR absorption rate of the first thin film decreases before that of the second thin film.

6. A method for determining the end of a chemical mechanical polishing (CMP) process which is used to remove a dielectric layer of a semiconductor chip with a stop layer underneath together on a first side of the semiconductor chip, the dielectric layer and the stop layer absorbing IR light of different wavelengths, the method comprising the steps of:

adjusting to guide an IR light source to the first side of the semiconductor chip;

using an IR detector installed on a second side of the semiconductor chip to detect the emitted IR light;

plotting the IR absorption rates of the dielectric layer and the stop layer;

starting a CMP process and using the IR absorption rates of t the dielectric layer and the stop layer to make an IR absorption curve; and

determining a polishing end-point of the CMP process when the IR absorption rate of the dielectric layer is apparently not changing and the IR absorption rate of the stop layer starts to decrease.

7. The method of claim 6, wherein the dielectric layer is made of a silicon oxide layer.

8. The method of claim 6, wherein the stop layer is made of a silicon nitride layer.

9. The method of claim 6, wherein the IR absorption rates of the first and second thin films fall in an infrared spectrum.

10. The method of claim 6, wherein the IR absorption rate of the first thin film decreases before that of the second thin film.

FIG. 1 is a schematic view showing the conventional method for detecting the end of a CMP process;

FIG. 2 is a schematic view of the disclosed method for detecting the end of a CMP process; and

FIG. 3 shows the relation of the IR absorption rate of the silicon oxide layer and the silicon nitride layer to the wavelength during the CMP process.

Fig. 2: Detector

Fig. 3: Wavelength, Absorption rate, Peak 1, Peak 2